

## MAT.07.PT.4.CCNTR.A.272

Sample Item ID:	MAT.07.PT.4.CCNTR.A.272
Title:	City Centers
Grade:	07
Primary Claim:	<b>Claim 4: Modeling and Data Analysis</b> Students can analyze complex, real-world scenarios and can construct and use mathematical models to interpret and solve problems.
Secondary Claim(s):	<p><b>Claim 2: Problem Solving</b> Students can solve a range of well-posed problems in pure and applied mathematics, making productive use of knowledge and problem-solving strategies.</p> <p><b>Claim 1: Conceptual Understanding and Procedural Fluency</b> Students can explain and apply mathematical concepts and interpret and carry out mathematical procedures with precision and fluency.</p>
Primary Content Domain:	<b>Geometry</b>
Secondary Content Domain(s):	Ratios and Proportional Relationships Number and Operations—Fractions
Assessment Target(s):	<p>4 A: Apply mathematics to solve problems arising in everyday life, society, and the workplace.</p> <p>4 G: Identify, analyze, and synthesize relevant external resources to pose or solve problems.</p> <p>2 A: Apply mathematics to solve well-posed problems arising in everyday life, society, and the workplace.</p> <p>1 A: Analyze proportional relationships and use them to solve real-world and mathematical problems.</p> <p>1 B: Apply and extend previous understandings of operations with fractions to add, subtract, multiply, and divide rational numbers.</p> <p>1 E: Draw, construct, and describe geometrical figures and describe the relationships between them.</p>
Standard(s):	7.RP.3, 7.G.1, 5.NF.5, 5.NF.6, 4.MD.1, 4.MD.2
Mathematical Practice(s):	1, 2, 6
DOK:	3
Item Type:	PT
Score Points:	13
Difficulty:	M
How this task addresses the “sufficient evidence” for this claim:	This task requires student to produce a scale drawing (in <i>Part A</i> ) and then use scale factors to identify actual distances using a map that is drawn to scale.
Target-Specific Attributes (e.g., accessibility issues):	Students will be required to manipulate a ruler and review a map as part of this performance task.
Stimulus/Source:	
Notes:	
Task Overview:	Students will start by creating a rudimentary map drawn to scale. Students will then use a map (drawn to scale) of

## Grade 7 Mathematics Sample PT Form

	Washington, D.C., to plan a walking route and a bus route.
Teacher Preparation / Resource Requirements:	See prework below. The teacher is required to make copies and find materials prior to the administration of this task.
Teacher Responsibilities During Administration:	Teachers will monitor student activity during the administration of this performance task.
Time Requirements:	A total of 120 minutes over two sessions. Complete <i>Parts A, B, and C</i> in Session 1. Complete <i>Parts D and E</i> in Session 2.

### Prework:

Prior to starting the task, teachers will need to—

- collect enough rulers for the class,
- collect enough  $\frac{1}{4}$ -inch graph paper for the class, and
- print enough copies of the map of the National Mall (see below) for the class.

Printable scale map of the National Mall:

[http://wikitravel.org/upload/shared//6/64/National\\_Mall\\_map.png](http://wikitravel.org/upload/shared//6/64/National_Mall_map.png)

## City Centers

Scale drawings and maps of cities can be very helpful for determining distances between important landmarks. With the right map and a little planning, vacations to places like Washington, D.C., can be both fun and informative.

### Part A

Using the ruler and graph paper provided by your teacher, create a scale drawing of a city center. Use the information below to create your drawing.

- The scale for your drawing is 1 inch = 2 miles.
- Use dots to represent the buildings on your map.
- Place City Hall near the top left of the paper.
- Draw two streets moving away from City Hall. The two streets should be at  $90^\circ$  angles.
- Along one street, place the Post Office two miles away from

City Hall and the Police Station three miles away from City Hall.

- Along the other street, place the Fire Station  $1\frac{1}{2}$  miles from City Hall, the Elementary School  $2\frac{1}{2}$  miles from City Hall, and the Middle School 3 miles from City Hall.
- Draw streets connecting the Police Station to the Fire Station and Middle School.
- Draw a street connecting the Post Office to the Elementary School.

Use your scale drawing to answer the questions below. For each question, you must justify your answer using mathematics and/or words.

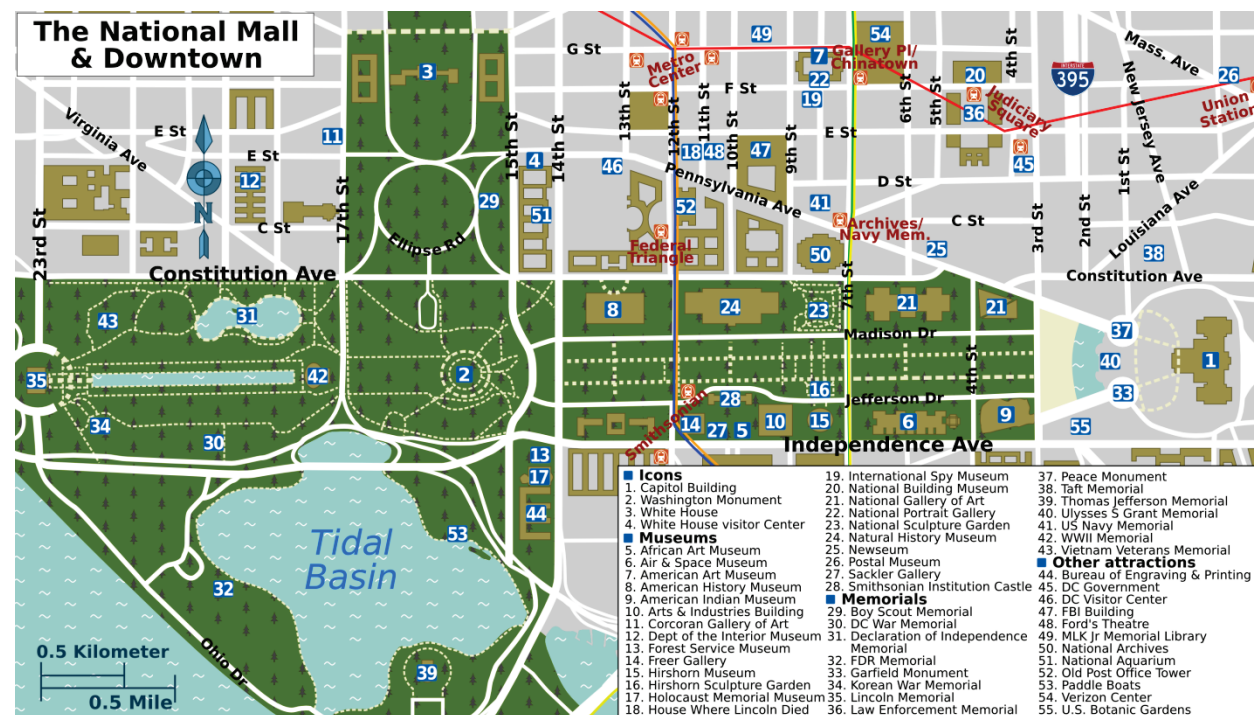
1. What is the approximate direct distance, in miles, between the Post Office and the Elementary School?

2. What is the approximate direct distance, in miles, between the Police Station and the Middle School?

3. What is the approximate shortest distance, in miles, between the Police Station and the Middle School if you must pass by the Post Office?

**Part B**

Having a scale drawing or map can be helpful in planning a trip. For the remaining parts of this task, you will use the map<sup>1</sup> of the National Mall and downtown Washington, D.C., provided by your teacher.



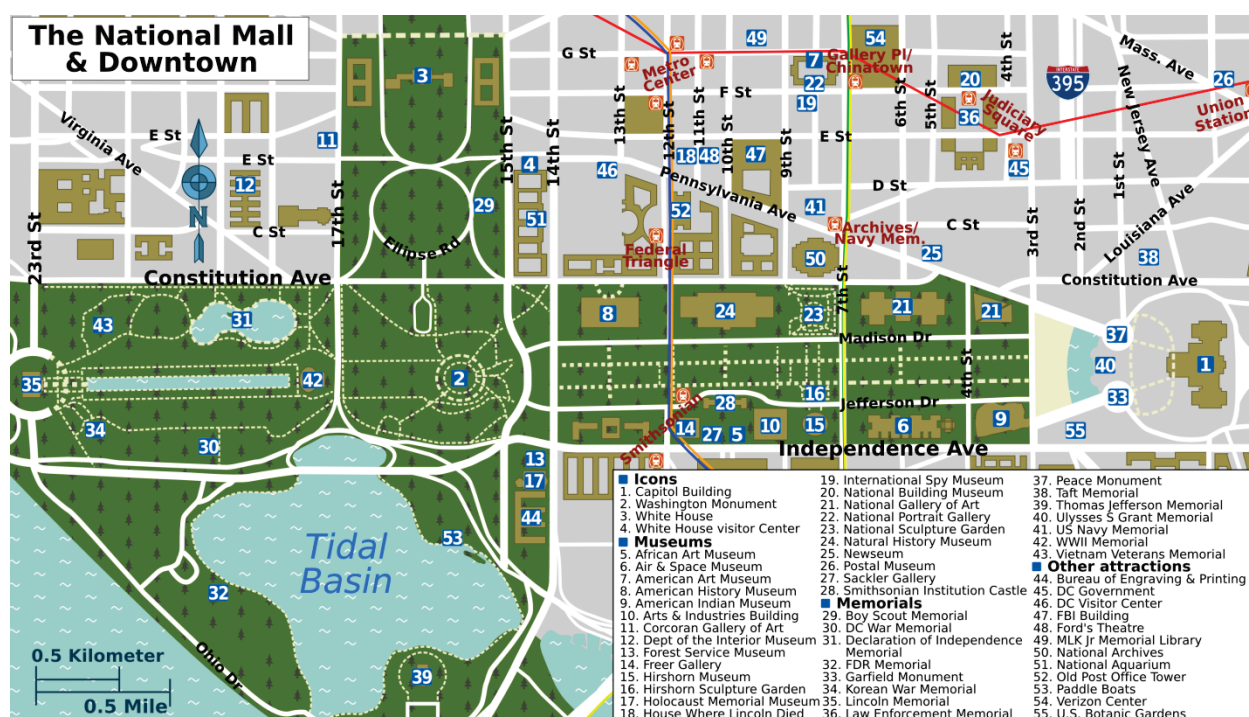
Use the map and your ruler to answer the questions below. For each question, you must justify your answer using mathematics and/or words.

4. What is the approximate straight-line distance, in miles, between the White House and the Washington Monument?

5. What is the approximate straight-line distance, in miles, between the Washington Monument and the Capitol Building?

## Part C

Use the map and your ruler to plan a **walking** tour of the area.



Use the information below to plan your tour.

- The walking tour must be no more than 2 miles.
- The walking tour must include 5 stops. The starting location does not count as a stop. However, the final location does count as a stop.
- To improve the accuracy of your measurement, measure along streets (solid lines) and foot paths (dashed lines). Do **not** measure straight-line distances.

Use the table below to organize the stops of your walking tour.

**Washington, D.C. Walking Route**

Location	Distance from Previous Location (in miles)	Cumulative Distance of Route (in miles)

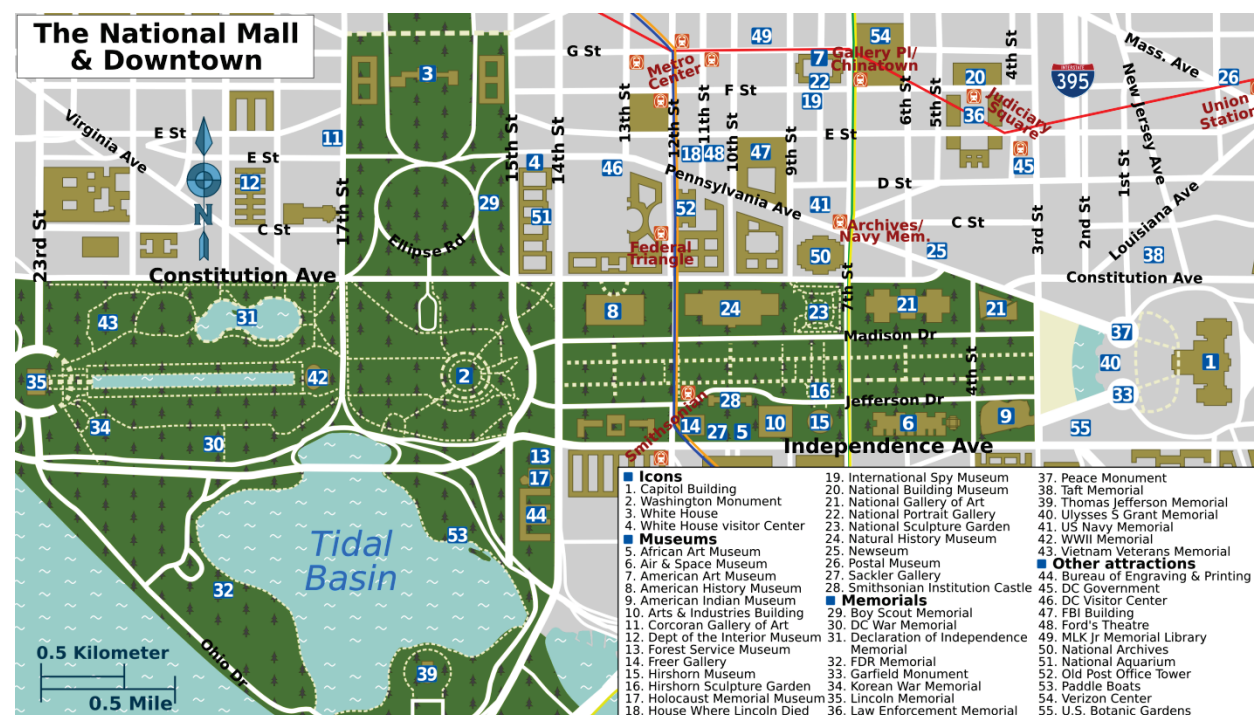
**End of Session 1**



## Session 2

### Part D

Use the map and your ruler to plan a **bus** tour of the area.



Use the information below to plan your tour.

- The bus tour must start at the final location of your walking tour in **Part C**.
- The bus tour must be at least 5 miles.
- The bus tour must include 3 stops. The starting location does not count as a stop. However, the final location does count as a stop.
- The bus tour must stop at the Capitol Building. (If your walking tour included the Capitol Building, then the bus tour must stop at the White House.)
- To improve the accuracy of your measurement, measure along streets. Do **not** measure straight-line distances.

Describe your bus tour in the space provided. Your response must include the:

- starting location
- location of each stop
- distance between each stop
- ending location
- total distance, in miles, traveled

### **Part E**

Using the bus tour route you developed in **Part D**, create a table that displays the morning bus schedule. Use the information below to develop the schedule.

- The bus schedule will show the time that the bus leaves each stop.
- The morning bus run starts at 9 a.m.
- The morning bus run ends at 12 p.m. The bus will not start a route if it will end after 12 p.m.
- The bus will start at one end of the route, go to the other end, and then return to the starting point.
- The bus will spend 10 minutes at each stop that forms the end of the route. The bus will spend 5 minutes at each stop in the middle of the route.
- The bus will travel between stops at an average rate of 20 miles per hour.

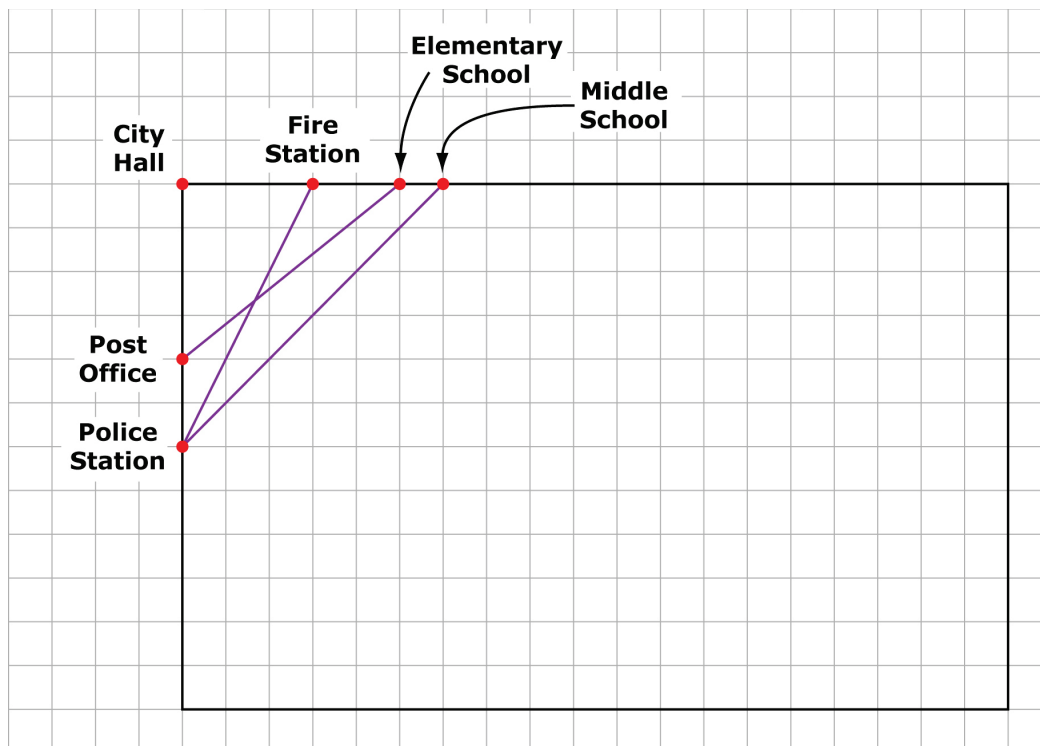


Below the table you created, show how you calculated the amount of time the bus will spend traveling between stops.

**End of Session 2**

*Sample Top-Score Response:***Part A**

The student's scale drawing will not be scored. However, a sample drawing has been provided below.



1. The distance from the Post Office to the Elementary School is approximately  $3\frac{1}{4}$  miles.

$$1\frac{5}{8} \times 2 = \frac{13}{8} \times \frac{2}{1} = \frac{26}{8} = 3\frac{1}{4}$$

2. The distance from the Police Station to the Middle School is approximately  $5\frac{3}{4}$  miles.

$$2\frac{7}{8} \times 2 = \frac{23}{8} \times \frac{2}{1} = \frac{46}{8} = 5\frac{3}{4}$$

3. The distance from the Police Station to the Middle School, passing by the Post Office, is approximately  $6\frac{3}{4}$  miles.

$$\left(\frac{1}{2} \times 2\right) + 3\frac{1}{4} + \left(1\frac{1}{4} \times 2\right) = 1 + 3\frac{1}{4} + 2\frac{1}{2} = 1 + 3\frac{1}{4} + 2\frac{2}{4} = 6\frac{3}{4}$$

**Part B**

The scale of the drawing used for the answers in *Parts B, C, and D* is 1 inch is equal to 0.5 mile.

4. The distance from the White House to the Washington Monument is approximately  $1\frac{1}{8}$  miles.

$$2\frac{1}{4} \times \frac{1}{2} = \frac{9}{4} \times \frac{1}{2} = \frac{9}{8} = 1\frac{1}{8}$$

5. The distance from the Washington Monument to the Capitol Building is approximately  $2\frac{3}{4}$  miles.

$$5\frac{1}{2} \times \frac{1}{2} = \frac{11}{2} \times \frac{1}{2} = \frac{11}{4} = 2\frac{3}{4}$$

**Part C**

Student answers will vary. The chart below is one example of a walking route that fulfills the requirements presented to the student.

Location	Distance from Previous Location (in miles)	Cumulative Distance of Route (in miles)
Arts and Industries Building	0	0
Air & Space Museum	$\frac{1}{4}$	$\frac{1}{4}$
American Indian Museum	$\frac{3}{8}$	$\frac{5}{8}$
National Gallery of Art	$\frac{3}{8}$	1
National Sculpture Garden	$\frac{9}{16}$	$1\frac{9}{16}$
Natural History Museum	$\frac{5}{16}$	$1\frac{7}{8}$

**Part D**

Student answers will vary. The chart below is one example of a bus route that fulfills the requirements presented to the student.

Location	Distance from Previous Location (in miles)	Cumulative Distance of Route (in miles)
Natural History Museum	0	0
Capitol Building	$1\frac{13}{16}$	$1\frac{13}{16}$
Bureau of Engraving & Printing	$2\frac{3}{4}$	$4\frac{9}{16}$
National Aquarium	$1\frac{1}{8}$	$5\frac{11}{16}$

**Part E**

Student answers will vary. The chart below is one example of a bus route that fulfills the requirements presented to the student.

Location	Departure Times			
Natural History Museum	9:00		10:12	
Capitol Building	9:10	9:57	10:22	11:11
Bureau of Engraving & Printing	9:23	9:44	10:35	10:56
National Aquarium		9:36		10:48

The bus will take 5.4 minutes to go from the Natural History Museum to the Capitol Building.

$$1\frac{13}{16} \div 20 = \frac{29}{320} = 0.091, 0.091 \times 60 = 5.4$$

The bus will take 8.25 minutes to go from the Capitol Building to the Bureau of Engraving & Printing.

$$2\frac{3}{4} \div 20 = \frac{11}{80} = 0.138, 0.138 \times 60 = 8.25$$

The bus will take 3.37 minutes to go from the Bureau of Engraving & Printing to the National Aquarium.

$$1\frac{1}{8} \div 20 = \frac{9}{160} = 0.056, 0.056 \times 60 = 3.37$$

*Scoring Notes:* While the student-produced scale drawing in *Part A* is not scored, the answers to the questions in *Part A* are scored. Each part of the task has a separate rubric.

*Scoring Rubric:*

*Responses to this item will receive 0–13 points, based on the following:*

**Part A**

**2 points:** The student demonstrates understanding of creating a scale drawing and using that drawing to calculate the actual distance between two locations. The student accurately measures the distance between all locations and correctly calculates the actual distance between the two locations.

**1 point:** The student demonstrates partial understanding of creating a scale drawing and using that drawing to calculate the actual distances between two locations. The student inaccurately calculates the distance between two locations at least once. **OR** The student correctly calculates the actual distance using inaccurate measurements at least once.

**0 points:** The student shows inconsistent or no understanding of creating a scale drawing and using that drawing to calculate the actual distances between two locations.

**Part B**

**2 points:** The student demonstrates understanding of using a scale drawing to calculate the actual distance between two locations.

**1 point:** The student demonstrates partial understanding of creating a scale drawing and using that drawing to calculate the actual distances between two locations. The student inaccurately calculates the distance between two locations at least once.

**0 points:** The student shows inconsistent or no understanding of creating a scale drawing and using that drawing to calculate the actual distances between two locations.

**Part C**

**3 points:** The student demonstrates thorough understanding of how to use a scale drawing to plan a route when given a set of constraints. The student calculates a route that meets all of the constraints and provides accurate justification that the route meets the requirements.

**2 points:** The student demonstrates partial understanding of how to use a scale drawing to plan a route when given a set of constraints. The student creates a route that meets all of the requirements, but the justification that the route meets the requirements includes calculation errors.

**1 point:** The student demonstrates limited understanding of how to use a scale drawing to plan a route when given a set of constraints. The student creates a route that does not meet all of the requirements, but the justification includes no calculation errors. **OR** The

student creates a route that meets the error, but the justification includes significant calculation errors (that may cause confusion about whether the student has a route that meets the requirements).

**0 points:** The student demonstrates inconsistent or no understanding of how to use a scale drawing to plan a route when given a set of constraints.

**Part D**

**3 points:** The student demonstrates thorough understanding of how to use a scale drawing to plan a route when given a set of constraints. The student calculates a route that meets all of the constraints and provides accurate justification that the route meets the requirements.

**2 points:** The student demonstrates partial understanding of how to use a scale drawing to plan a route when given a set of constraints. The student creates a route that meets all of the requirements, but the justification that the route meets the requirements includes calculation errors.

**1 point:** The student demonstrates limited understanding of how to use a scale drawing to plan a route when given a set of constraints. The student creates a route that does not meet all of the requirements, but the justification includes no calculation errors. **OR** The student creates a route that meets the error, but the justification includes significant calculation errors that may cause confusion about whether the student has a route that meets the requirements.

**0 points:** The student demonstrates inconsistent or no understanding of how to use a scale drawing to plan a route when given a set of constraints.

**Part E**

**3 points:** The student demonstrates thorough understanding of using a rate to calculate how many minutes a bus takes to go a certain distance and using that information to complete a schedule. The student correctly calculates the number of minutes the bus will spend driving between stops and accurately completes a table that represents the bus schedule.

**2 points:** The student demonstrates partial understanding of using a rate to calculate how many minutes a bus takes to go a certain distance and using that information to complete a schedule. The student correctly calculates the number of minutes the bus will spend driving between stops, but does not accurately complete the table.

**1 point:** The student demonstrates limited understanding of using a rate to calculate how many minutes a bus takes to go a certain distance and using that information to complete a schedule. The student incorrectly calculates the number of minutes the bus will spend driving between stops, but uses that information consistently to complete the table.

**0 points:** The student demonstrates inconsistent or no understanding of using a rate to calculate how many minutes a bus takes to go a certain distance and using that information to complete a schedule.

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<sup>1</sup> The map should be downloaded and printed from the link shown in “Prewrite.” The map shown on this page is a smaller version and is not intended as the map the student will work with.